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ABSTRACT

The development of a data-based technical education curriculum at Western Kentucky University is described, with consideration of: assessment of the technical needs of the industrial community to identify topics for inclusion in the computer integrated manufacturing technology (CIMT) curriculum, assessment of available physical and human resources, assessment of the scope of each course and prerequisites, curriculum verification, and curriculum implementation. To determine the technical needs of the industrial community, a survey was developed and sent to 550 industries in Kentucky and Tennessee. Industry respondents ranked 85 topics that might be addressed by the CIMT curriculum. Projected equipment needs were identified based on the topics identified by the industrial community. To obtain required equipment, grants were written and industrial donations sought. The primary resource identified was faculty training. Faculty and industrial advisory committees evaluated the courses required in the CIMT program. Appendices provide: the CIMT survey, a list of proposed courses and content, and a list of courses by semester for the bachelor's level industrial technology major. 7 references. (SW)

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A DATA BASED MODEL FOR THE DEVELOPMENT OF TECHNICAL EDUCATION PROGRAM CURRICULA AT INSTITUTIONS OF HIGHER EDUCATION

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October 1987

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HE 021 232

A DATA BASED MODEL FOR THE DEVELOPMENT OF TECHNICAL EDUCATION PROGRAM CURRICULA AT INSTITUTIONS OF HIGHER EDUCATION

America is currently experiencing a second industrial revolution initiated by computer integration into manufacturing processes. Computer integrated manufacturing (CIM) involves computer applications to what are termed "islands of automation", e.g., computer aided drafting (CAD), computer aided manufacturing (CAM), flexible manufacturing systems (FMS), and computer aided process planning (CAPP). The application and integration of computer technologies to production situations are a key to future productivity gains. Hence, a dilemma facing educational institutions at all levels, but especially institutions of higher education, is how best to accomplish the technical education task at hand.

In technology education, this dilemma represents a challange to traditionally oriented curriculums. With many universities developing CIMT programs, questions arise on how to define CIMT and how to structure the coursework around an ever changing curricula. Revisions of a technical education program curricula can involve many concerns e.g., how should faculty members be trained on new technologies, how should new curriculums be developed and verified, what courses should be modified, can the program be flexible enough to maintain current technologies while taking a proactive posture toward future changes in the field, what equipment is needed and how fast must it be acquired? In addition to providing specific technical training (e.g., computer assisted drafting) a CIM

curriculum must also provide a broad based general education as well. Thus, answering these concerns becomes the first problem in establishing a CIMT curriculum.

The objective of the CIMT program at the Department of Industrial and Engineering Technology at Western Kentucky University, is to prepare technicians for managerial and supervisiory positions in the computer assisted factories of the future. The CIM techicians trained at Western are not research oriented engineers. In contrast, they are concerned with the applications of computer based technologies in the control of production situations.

To provide for the proper curricula and learning environments for these students, research on the new and emerging technologies, studies of departmental resources, and curricula modifications were required. Since a technical education curricula should be data based, it therefore, should be the result of a collaborative interchange between institutions of higher education and industry. To provide for this interchange, the CIMT curriculum development project involved surveys of the literature and industrial community, industrial advisory committee meetings, and input from state government agencies.

TECHNICAL NEEDS ASSESSMENT:

The first phase of the project was an assessment of the technical needs of the industrial community. To achieve this

goal, a review of the literature was conducted and survey instrument developed. One similar study titled A Baccalaureate Degree Program Model for Computer Integrated Manufacturing, (Foston, 1983) provided helpful information for constructing the instrument. Foston conducted a survey of 139 medium to large size industries in California to assess courses to be included in a CIM program at California State University, Fresno, CA. The California State survey was the only CIM curriculum survey example available at the time of the Western study. In addition, the California study represented an attempt to identify courses for an engineering based curriculum not a technology corriculum.

For the Western study, the faculty believed topics to be included in CIMT courses would provide more relevant information than course titles which might not be representative of technical course content. To determine the topics for inclusion on the instrument, the faculty reviewed the literature, attended regional and national seminars on CIM, and conducted several industrial advisory committee meetings. The industrial advisory committee proved to be a vital body in providing guidance and assistance to the program and invaluable in refining the instrument and analyzing results.

Respondents to the study were asked to rank each topic under tha catagories: not needed in the program, some need for this topic, a great deal of need for this topic, or no opinion on this topic. A copy of the instrument is included in

Appendix I.

The survey was mailed to 550 industries in Kentucky and Tennessee. These companies were selected from state directories of manufacturers on the basis on number of employees and product produced. To limit the study to industries likely to be involved in CIM revisions, companies with larger than 50 employees and producing a hard product were used. The survey asked respondents to rank the 85 topics on their need in a CIMT program under the major headings of: Ogranizational Management, Computer Applications in Industry, Industrial Materials and Fabrication Processes, Industrial Engineering Functions and Quality Assurance, and graphics Communications, Drafting and Design. The results are tabulated in Appendices II through V under these catagories. Appendices VI through VIII provide a listing of the topics from highest to lowest rankings.

The study was extremely helpful in identifying the topics relevant to a CIMT program. Although some indecision by the industry community on topic priorities was revealed, discussions with industrial advisory groups helped to categorize the topics for immediate inclusion in the program and those which could be phased in gradually. A replication of the study to validate topics and assess changes in the field is planned for later this year. Future replications are planned on a regular basis to maintain a current assessment of manufacturing technology topics.

RESOURCE ASSESSMENT:

After identification of the topics for inclusion in the CIMT program, faculty committees were assigned to assess available physical and human resources. In his presentation to the Society of Manufacturing engineers in 1984, Foston stressed the importance of the physical resources when he stated the technical nature of industrial technology programs require students to have experience with the methods and processes of industry in well equipped laboratories reflecting contemporary industry, (Foston, 84).

To provide an assessment of physical resources, the faculty evaluated existing equipment and laboratories. Projected equipment needs based on the topics identified by the industrial community were then identified. After the initial evaluations, industrial advisory committee members were consulted to assess survey results and provide consultations prior to equipment acquisitions.

When the required equipment was identified, faculty members began assessing methods of equipment acquisition and establishing priorities. Grants were written and industrial donations sought. Many of these were successful, including a grant from the National Science Foundation for an industrial grade robot which was used to complete the establishment of a flexible manufacturing cell. Donations of new and used industrial grade equipment valued at over $350,000.00 were received through negotiations with local industries during the

first year. The university also provided matching funds which were used to purchase additional equipment.

However, the primary resource identified as vital to the success of the CIMT program was not equipment but faculty training. To provide for advanced training of existing faculty on the new and emerging CIM technologies, two grants from the BlueGrass State Skills Corporation of Frankfort, Kentucky were sought. The BlueGrass grants ran concurrently during the 1985 and 1986 fiscal years and provided 8 faculty members training in 11 CIM areas as well as seminars for the local industrial community. Some of these advanced training seminars were conducted by major industries such as GMF Robotics and organizations such as the Society of Manufacturing Engineers. After the advanced training activities were completed, faculty members began curriculum revisions to incorporate the new technologies into existing courses and development of new courses as required.

CURRICULUM DEVELOPMENT:

To evaluate the necessary courses required in the CIMT program, numerous faculty and industrial advisory committee meetings were conducted. The scope of each course was analyzed and prerequisites assessed. Course content was outlined but details on curriculum development were delegated to individual faculty members who had been trained on the technology. Final curriculum changes were then reviewed and

approved by the faculty and appropriate university committees.

Course sequence also became a vital component of the curriculum process. Although the survey instrument did not yield course sequences, it illustrated the need for a structured sequence and a rigidly enforced set of prerequisites. To provide for this structure, a program design listing courses semester by semester and year by year was adopted. This course sequencing throughout the CIMT program is currently being phased into the univeristy registration sequence and faculty advising. A copy of the current undergraduate degree program in CIMT is included in Appendix IX.

CURRICULUM VERIFICATION:

The CIMT curriculum verification process is currently underway. The original survey instrument is being revised by faculty and industrial advisory groups and a replication of the survey is planned for this year. Through faculty and advisory committee assessments, the current curriculum will be modified as indicated from the replicated study results in a process similar to the original. Thus, the data base nature of the technical curriculum will be maintained.

A technical curriculum must keep pace with the industrial community it serves. With manufacturing expected to evolve more in the next ten years than it has in the past

fifty, (Ridings, 83), teaching effectiveness, instructional aids and systems, quality of the graduates, and placement of graduates must be reviewed at regular intervals (Foston, 84). An extremely important aspect of this ongoing self-evaluation is the use of input from faculty members, graduates from the program, and employers of the program graduates.

CURRICULUM IMPLEMENTATION:

The CIMT program was implemented at Western in 1986. The response from the faculty, students, administration, and industrial community has been overwhelming. Enrollment in the program has increases dramatically with new students and numerous transfers from other universities and departments. Industrial donations and grants to the department in support of the CIMT program are continuining and have reached over $1,300,000.00 over the last four years. The support for the efforts of the faculty are also evident through an expanded relationship with the industrial community, other universities, state governmental agencies, and the local Chamber of Commerce.

The CIMT program development project also led to the establishment of a Center for Manufacturing at the university. The purpose of the center is to expand the interaction between the Industrial and Engineering Technology Department and the industrial community while providing a vehicle for technology transfer.

Although the CIMT program is relatively new, it has already proven to be a technical curricula for the future. The faculty and university administration have realized the importance of program flexibility, the necessity of state-of-the-art equipment and laboratories, and continuous faculty training to maintain the technical curricula. Continued evaluations of industrial trends in contemporary manufacturing technology are planned and additional equipment and faculty training are being sought. Future studies, evaluations, and incorporation of data based results will provide the continued growth and expansion required of the CIMT program curricula.

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Appendix I a

COMPUTER INTEGRATED MANUFACTURING TECHNOLOGY SURVEY

INTRODUCTION

The CIMT technologist is concerned with applying computer assisted methods to all phases of industrial production including: drafting and design, numerical control, industrial engineering, quality assurance, and production scheduling. He or she is trained in modern industrial manufacturing and provides assistance in applying computer to business functions.

In large companies, the CIMT technologist works closely with and in support of the manufacturing and industrial engineers. In smaller companies, they may be one of only a few specially trained individuals who supervise manufacturing activities.

The general educational core of the CIMT program is established by the university and is not the subject of this survey. The following is primarily a list of course TOPICS, and not specific course titles.

Your responses are very important to the program. The results from this survey will be summarized and used to form the foundation for the CIMT courses. Please mark each item in the parentheses as you feel they should apply to the training of computer integrated manufacturing technologists. Mark your choices according to the following scale:

(0) NO OPINION ON THIS ITEM
(!) NOT NEEDED IN THE PROGRAM
(2) SOME NEED FOR THIS TOPIC
(3) A GREAT DEAL OF NEED FOR THIS TOPIC

PROPOSED COURSE CONTENT - TOPICS IN CIMT

SANITATIONAL MANAGEMENT AREA:

( ) Administration and organizational behavior
( ) Principles of marketing
( ) Personnel management
( ) Industrial psychology
( ) Economics
( ) Production management

COMPUTER APPLICATIONS IN INDUSTRY:

( ) Case studies in computer integrated manufacturing
( ) Computer system analysis and design
( ) File organization and data base systems
( ) Technical report writing (using word processors)
( ) Computer aided production operations and methods
( ) Computer assisted numerical control programming
( ) Spread sheet applications in industrial management
( ) Applications of industrial computers
( ) Microcomputer fundamentals
( ) Mini/microcomputers as system components
( ) Industrial software applications & selection
( ) Manual numerical control programming
( ) Numerical control programming laboratory

INDUSTRIAL MATERIALS AND FABRICATION PROCESSES:

( ) Industrial equipment selection
( ) Use and applications of precision instruments
( ) Industrial fabrication techniques
( ) Introduction to automation - History and trends
( ) Production techniques using FMS (Senior project)
( ) Industrial electricity and electronics fundamentals
( ) Programmable controllers
( ) Electrical diagonistic techniques
( ) Electrical switching devices
( ) Industrial safety
( ) Ergonomics considerations in manufacturing operations
( ) Casting and forging operations
( ) Basic welding processes
( ) Industrial tool selection and applications
( ) Industrial materials and processes
( ) Machine maintenance and set up
( ) Flexible manufacturing systems (FMS)
( ) Robotics applications in industry
( ) Relay logic
( ) Electrical applications in industry
( ) Single and three phase circuits
( ) OSHA regulations and requirements
( ) Safety psychology
( ) Materials testing
( ) Heat treating
( ) Statics and strength of materials

INDUSTRIAL ENGINEERING FUNCTIONS AND QUALITY ASSURANCE:

( ) Product quality control
( ) Statistical methods and analysis
( ) Industrial applications of coordinate measuring machines
( ) Manufacturing equipment planning
( ) Plant layout and facility planning
( ) Computer assisted production planning and control (CAPP)
( ) Manufacturing resource planning MRP II
( ) Production feasability analysis and manufacturing economics
( ) Methods, time, and motion analysis and standard data
( ) Industrial process control
( ) Statistical process control
( ) Industrial visual inspection techniques
( ) Materials handling equipment and processes
( ) Material flow analysis
( ) Production scheduling and control
( ) Manufacturing in process and inventory control
( ) Computer assisted line balancing
( ) JIT and zero inventory methods

GRAPHICS COMMUNICATIONS, DRAFTING AND DESIGN FUNCTIONS:

( ) Basic drafting skills, (lines, lettering, techniques)
( ) Sections, auxiliaries, (primary and secondary)
( ) Tolerance relationships and production drawings
( ) Computer aided drafting - two dimensional
( ) CAD systems and file management
( ) CAD/CAM data base communications and integration
( ) Computer aided wire frame drafting
( ) Descriptive geometry
( ) Jig and fixture design
( ) Lithographic screen and relief
( ) Camera ready copy presentation
( ) Orthographic projection and visualization
( ) Geometric dimensioning and tolerancing
( ) Threads, fasteners and fits
( ) Die design and drafting
( ) IGES and other communication systems
( ) Solids modeling
( ) Interactive graphics laboratory
( ) Technical illustration and rendering
( ) Basic printing procedures
( ) Dark room and photographic procedures
( ) Industrial photography

PLEASE ADD ANY OTHER TOPICS YOU FEEL ARE NEEDED.

_____

_____

_____

_____

_____

COMMENTS:

_____

_____

_____

_____

_____

PLEASE INDICATE YOUR JOB TITLE

_____

Thank you for your cooperation.

Appendix 2

PROPOSED COURSE CONTENT - TOPICS IN CIMT

ORGANIZATIONAL MANAGEMENT AREA:

2.57 (6) Production management
1.80 (3) Personnel management
1.80 (5) Economics
1.51 (1) Administration and organizational behavior
1.50 (2) Principles of marketing
1.48 (4) Industrial psychology

COMPUTER APPLICATIONS IN INDUSTRY:

2.73 (11) Computer aided production operations and methods
2.50 (14) Applications of industrial computers
2.25 (12) Computer assisted numerical control programming
2.25 (17) Industrial sofrware applications & selection
2.22 (9) File organization and data base systems
2.10 (8) Computer system analysis and design
2.05 (7) Case studies in computer integrated manufacturing
1.97 (19) Numerical control programming laboratory
1.95 (10) Technical report writing (using word processors)
1.93 (15) Microcomputer fundamentals
1.90 (13) Spread sheet applications in industrial management
1.88 (18) Manual numerical control programming
1.80 (16) Mini/microcomputers as system components

PROPOSED COURSE CONTENT - TOPICS IN CIMT

INDUSTRIAL MATERIALS AND FABRICATION PROCESSES:

2.40	(37)	Robotics applications in industry
2.22	(26)	Programmable controllers
2.08	(34)	Industrial materials and processes
2.03	(36)	Flexible manufacturing systems (FMS)
1.92	(22)	Industrial fabrication techniques
1.87	(4)	Production techniques using FMS (Senior project)
1.87	(33)	Industrial tool selection and applications
1.83	(5)	Industrial electricity and electronics fundamentals
1.83	(20)	Industrial equipment selection
1.83	(35)	Machine maintenance and set up
1.75	(7)	Electrical diagonistic techniques
1.73	(29)	Industrial safety
1.73	(5)	Statics and strength of materials
1.72	(30)	Ergonomics considerations in manufacturing operations
1.65	(21)	Use and applications of precision instruments
1.63	(41)	OSHA regulations and requirements
1.62	(3)	Materials testing
1.57	(8)	Electrical switching devices
1.52	(3)	Introduction to automation - History and trends
1.47	(2)	Safety psychology
1.45	(39)	Electrical applications in industry
1.42	(2)	Basic welding processes
1.35	(1)	Casting and forging operations
1.33	(40)	Single and three phase circuits
1.32	(4)	Heat treating
1.30	(38)	Relay logic

Appendix 4

PROPOSED COURSE CONTENT - TOPICS IN CIMT

INDUSTRIAL ENGINEERING FUNCTIONS AND QUALITY ASSURANCE:

2.50 (51) Computer assisted production planning and control (CAPP)
2.42 (47) Statistical methods and anslysis
2.40 (46) Product quality control
2.58 (55) Industrial process control
2.37 (56) Statistical process control
2.33 (60) Production scheduling and control
2.30 (61) Manufacturing in prociss and inventory control
2.15 (52) Manufacturing resource planning MRP II
2.12 (58) Material flow analysis
2.12 (54) Methods, time, and motion analysis and standard data
2.05 (63) JIT and zero inventory methods
2.02 (53) Production feasability analysis and manufacturing economics
2.01 (50) Plant layour and facility planning
1.95 (58) Materials handling equipment and processes
1.90 (62) Computer assisted line balancing
1.83 (49) Manufacturing equipment planning
1.80 (48) Industrial applications of coordinate measuring machine
1.72 (57) Industrial visual inspection techniques

Appendix 5

PROPOSED COURSE CONTENT - TOPICS IN CIMT

GRAPHICS COMMUNICATIONS, DRAFTING AND DESIGN FUNCTIONS:

2.20	(77)	Threads, fasteners, and fits
2.02	(69)	CAD/CAM data base communications and integration
2.01	(67)	Computer aided drafting - two dimensional
1.98	(66)	Tolerance relationships and production drawings
1.97	(68)	CAD systems and file management
1.87	(72)	Jig and fixture design
1.77	(76)	Geometric dimensioning and tolerancing
1.71	(64)	Basic drafting skills, (lines, lettering, techniques)
1.70	(78)	Die design and drafting
1.53	(71)	Descriptive geometry
1.37	(75)	Orthographic projection and visualization
1.35	(65)	Sections, auxiliaries, (primary and secondary)
1.32	(82)	Technical illustration and rendering
1.18	(80)	Solids modeling
1.12	(70)	Computer aided wire frame drafting
1.08	(83)	Basic printing procedures
1.07	(81)	Interactive graphics laboratory
.90	(79)	IGES and other communication systems
.83	(74)	Camera ready copy presentation
.82	(85)	Industrial photography
.80	(73)	Lithographic ready copy presentation
.72	(84)	Dark room and photographic procedures

Appendix 6

TOPICS IDENTIFIED FOR CIMT

(From 2.0 to 3.0 on a scale from 1 to 3)

11	2.73	Computer aided production operations and methods
06	2.57	Production management
51	2.50	Computer assisted production planning and control
14	2.50	Applications of industrial computers
47	2.42	Statistical methods and analysis
46	2.40	Product quality control
37	2.40	Robotics applications in industry
55	2.38	Industrial process control
56	2.37	Statistical process control
60	2.33	Production scheduling and control
61	2.30	Manufacturing in process and inventory control
17	2.25	Industrial sofware applications & selection
12	2.25	Computer assisted numerical control programming
26	2.22	Programmable controllers
09	2.22	File organization and data base systems
77	2.20	Threads, fasteners and fits
52	2.15	Manufacturing resource planning MRP II
59	2.12	Material flow analysis
54	2.12	Methods, time, and motion analysis and standard data
08	2.10	Computer system analysis and design
34	2.08	Industrial materials and processes
63	2.05	JIT and zero inventory methods
07	2.05	Case studies in computer integrated manufacturing
36	2.03	Flexible manufacturing systems
69	2.02	CAD/CAM data base communications and integration
53	2.02	Production feasability analysis and manufacturing economics
67	2.01	Computer aided drafting-two dimensional
50	2.01	Plant layout and facility planning

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Appendix 7

TOPICS IDENTIFIED FOR CIMT

(From 1.5 to 1.99 on a scale from 1 to 3)

66	1.98	Tolerance relationships and production drawings
19	1.97	Numerical control programming laboratory
68	1.97	CAD systmes and file management
10	1.95	Technical report writing (using word processors)
58	1.95	Materials handling equipment and processes
15	1.93	Microcomputer fundamentals
22	1.92	Industrial favrication techniques
13	1.90	Spread sheet applications in industrial management
62	1.90	Computer assisted line balancing
18	1.88	Manual numerical control programming
72	1.87	Jig and fixture design
33	1.87	Industrial tool selection and applications
24	1.87	Production techniques using FMS (Senior Project)
49	1.83	Manufacturing equipment planning
35	1.83	Machine maintenance and set up
25	1.83	Industrial electricity and electronics fundamentals
20	1.83	Industrial equipment selection
03	1.80	Personnel management
16	1.80	Mini/microcomputers as system components
05	1.80	Economics
48	1.80	Industrial applications of coordinate measuring
76	1.77	Geometric dimensioning and tolerancing
64	1.77	Basic drafting skills, (lines, lettering, techniques)
27	1.75	Electrical diagonistic techniques
45	1.73	Statics and strength of materials
29	1.73	Industrial safety
30	1.72	Ergonomics considerations in manufacturing operations
57	1.72	Industrial visual inspection techniques
78	1.70	Die design and drafting
21	1.65	Use and applications of precision instruments
41	1.63	OSHA regulations and requirements
43	1.62	Materials testing
28	1.57	Electrical switching devices
71	1.53	Descriptive geometry
23	1.52	Introduction to automation-History and trends
01	1.51	Administration and orgainzational behavior
02	1.50	Principles of marketing

Appendix 8

TOPICS IDENTIFIED FOR CIMT

(From 0 to 1.49 on a scale from 1 to 3)

04	1.48	Industrial psychology
42	1.47	Safety psychology
39	1.45	Electrical applications in industry
32	1.42	Basic welding processes
75	1.37	Orthographic projection and visualization
65	1.35	Sections, auxillaries, (primary and secondary)
31	1.35	Casting and forging operations
02	1.35	Principles of marketing
40	1.33	Single and three phase circuits
82	1.32	Technical illustration and rendering
44	1.32	Heat treating
38	1.30	Relay logic
80	1.18	Solids modeling
70	1.12	Computer aided wire frame drafting
83	1.08	Basic printing procedures
81	1.07	Interactive graphics laboratory
79	.90	IGES and other communication systems
74	.83	Camera ready copy presentation
85	.82	Industrial photography
73	.80	Lithographic screenand relief
84	.72	Dark room and photographic procedures

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WESTERN KENTUCKY UNIVERSITY
Department of Industrial & Engineering Technology
COMPUTER INTEGRATED MANUFACTURING
option in
*Industrial Technology
Bachelor of Science Major No. 571

	1st Semester			2nd Semester	
Eng 100	Freshman English	3	Psy 100	Intro to Psy	3
Math 118E	Alg & Trig	5	Hist 110/120	West Civ	3
GC 207	Engr. Drafting	3	PGA 201-207	Physics I & Labs	4
GC 101	Ind. Design	3	GC 204	Comp. Graphics I	1.5
LME 101	Use of Library	1	MET 108	Intro to Fluid Power	3
Elective:	Category E	1			14.5
		16			
	3rd Semester			4th Semester	
Eng 200	Intro to Literature	3	Chem 104-106	Chem Tech & Labs	4
MET 215	Statics & Stren. Matls.	3	Math 203	Statistics	3
GC 214	Adv. Engr. Drafting	3	MT 230	Intro to Plastics	3
PGA 202-208	Physics II & Lab	4	MT 317	Metal Proc. I	3
CS 230	BASIC Programming OR		MT 310	Industrial Safety	3
S Com 145	Intro to Speech	3	GC 208	Spatial Geometry	1.5
Elective:	Category E	1			17.5
		17			
	5th Semester			6th Semester	
Eng 300	Jr. Composition	3	EET 317	Elec. Machinery	3
Eng 307	Tech Writing	3	MT 340	Wood Technology	3
EET 120	Basic Electricity	3	MT 365	Manuf. & Inv. Control	3
MT 327	Metal Proc II	3	Electives:	Category C	3
MT 355	Prod/Oper. Mgmt	3		Category B-II	3
Elective:	Category C	3			15
		18			
	7th Semester			8th Semester	
BBM 256	Supervisory Mgmt	3	MT 300	Ind Finishing	3
MT 371	Stat. Qual. Control	3	MT 490	Senior Project	3
MT 401	Senior Seminar	1	Electives:	Category C	3
MT 452	Ind. Wood Proc.	3		Category B-II	3
MT 480	Comp. Aided Manuf.	3		Technical	3
EET 427	Prog. Logic Control	1.5			
Elective:	Category B-II	3			15
		17.5			

Approved Technical Electives

Env ET 360-365 Air Poll. Control	4	MT 341 Furniture Const.	3
GC 205 Computer Graphics II	1.5	MT 369 Co-op in CIMT	3
GC 342 Furniture Des.	3	MET 339 Materials Testing	1
MT 280 Machine & Tool Maint.	3		

ADVISORS: Dr. Conley; Mr. Jawahar; Dr. Mussnug; Dr. Pittman

NOTE:No grade below C is acceptable within the major. Consult University catalog for other academic regulations and policies.

Industrial Technology is a management oriented technical curriculum built upon a balanced program of studies drawn from a variety of disciplines related to industry. Included are a sound knowledge and understanding of materials and production processes, principles of distribution, and concepts of industrial management and human relations; experiences in communicative skills, humanities, and social studies; and a proficient level in the physical sciences, mathematics, design, and technical skills to permit the graduate to capably cope with technical, managerial, and production problems.

This **Computer Integrated Manufacturing** option is designed to prepare people to plan, direct and/or manage activities such as Drawing & Designing products and tooling using computer assisted design & drafting; programming and monitoring computer controlled machine tools, robots, and materials handling equipment; assessing quality control through statistical and computer assisted techniques; scheduling or supervising production & inventory control operations; coordination of plant layout and facilities development; developing employee training programs; and technical sales of automated equipment.

A Sample Degree Program is on the back of this sheet. This may be used as a check sheet and kept up-to-date until an official Degree Program is filed at the beginning of the 5th semester.

*Accredited by the National Association of Industrial Technology

August '88

UNDERGRADUATE DEGREE PROGRAM - WKU
BACCALAUREATE DEGREES

SAMPLE

APPENDIX 9

Student Social Security Number [ ]-[ ]-[ ]

Please complete this form in ink (transfer courses in red ink).

College of SCIENCE, TECHNOLOGY & HEALTH

Department of INDUSTRIAL & ENGINEERING TECHNOLOGY

Print Full Legal Name _____ (Last / First / Middle or Maiden)

Name of First Major or Area COMPUTER INTEGRATED MANUFACTURING

First Major or Area of Concentration

(571) INDUSTRIAL TECHNOLOGY
Ref. No. Title

List All Courses (Passed or Failed)

Department	Course No.	Hr.	Gr.
GC	101	3	
GC	202	3	
GC	209	1½	
GC	208	1½	
MT	310	3	
MT	355	3	
MT	385	3	
MT	371	3	
MT	300	3	
EET	120	3	
BBM	258	3	
ENG	307	3	
MT	401	1	
MT	490	3	
MT	230	3	
MT	317	3	
MT	327	3	
MT	340	3	
MT	452	3	
MT	480	3	
EET	317	3	
EET	427	1½	
MET	108	3	
MET	215	3	
GC	214	3	
Elec:		3	
Advisor:			

Subtotal Hours 71.5

Approved, Dept. Head. Date

THIS FORM IS TO BE COMPLETED AND FILED DURING THE JUNIOR YEAR. (After 60 hours and before 90 hours are completed)

23

First Minor or Second Major

( )
Ref. No. Title

List All Courses (Passed or Failed)

Department	Course No.	Hr.	Gr.
NOTE			
NO GRADE BELOW C IS			
ACCEPTABLE WITHIN THE			
MAJOR. SEE THE UNIVERSITY			
CATALOG FOR OTHER ACADEMIC			
POLICIES & REGULATIONS.			

Subtotal Hours

Approved, Dept. Head Date

Second Minor Ref. No. ( )

Subtotal Hours

Approved, Dept. Head Date

Professional Preparation Requirements

Note: This section is to be completed if student is seeking teacher certification.

Ed. 100/370	3	
Ed. 380	3	
Ed.		
Ed. 490	8	
Psy. 320	3	

Subtotal Hours

Date

Program Approved — Head, Dept. Education

General Education Requirements

	Dept. No.	Hr.	Gr.
A. Organization and Communication of ideas (9-12 hrs.)	Eng. 100	3	
	Eng. 200	3	
	CS 230 or COM 145	3	
B. Humanities (9-12 hrs.)	LitENG 300	3	
		3	
		3	
C. Social and Behavioral Studies (15 hrs.)	Hst. 119/120	3	
	Psy. 100	3	
		3	
		3	
		3	
D. Natural Science (minimum 9 hrs.) Mathematics (1 course)	PSA 201	3	
	PSA 202	3	
	Chem 104	3	
	Math. 118E	5	
E. Physical Development (2-3 hrs.)		1	
		1	
F. General Elect. (3 hrs.)	Math 203	3	

Subtotal Hours 55

OTHER REQUIREMENTS

LME 101	1	
PSA 207	1	
PSA 208	1	
Chem 106	1	

Subtotal Hours 4

Other Requirements

( ) Included are 42 upper division hours (300-499).
( ) Included are 30 hours and 36 weeks of residence. (One semester earned during senior year.)
( ) Includes one-third of hours in major, minor or area of concentration taken in residence.
( ) All University grade point average requirements in major, area, minor and overall have been met.
( ) Includes minimum of 128 unduplicated semester hours earned in courses numbered 100 or above.
( ) The following courses have been or will be taken by correspondence.

_____
_____
_____

Substitutions:

_____ for _____
_____ for _____
_____ for _____

Credits transferred from:

College	State	Year	Hours

First Date of Entry at W.K.U. _____ Sem. _____ Yr.

Proposed Date of Graduation _____ Mo. _____ Yr.

GRAND TOTAL HOURS (Sum of ALL Subtotal Hours) 130.5

Date

PROGRAM APPROVED — COLLEGE DEAN

(This program is valid for five (5) years from date signed by College Dean.)

White-Registrar Pink-Dean Yellow-Student

24

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Page 20